Section 56 — The FUNt Universal Boundary–Interface Law (UBIL)

Section 56 establishes the FUNt Universal Boundary–Interface Law (UBIL), which governs how systems interact at boundaries, interfaces, membranes, and transition surfaces across all φ-bands. UBIL defines how curvature, torsion, coherence, and identity behave when one system meets another — whether proton–proton, electron–lattice, cell–tissue, material–vacuum, or void–filament. UBIL formalizes the mathematics of contact, exchange, tunneling surfaces, matching conditions, and boundary coherence transfer.

56.1 Boundaries as Curvature–Torsion Transition Zones

• A boundary is any surface where Φ or τ changes discontinuously.

• Interfaces act as harmonic filters for ΔΦ and Δτ.

• Boundaries encode continuity: identity cannot break at interfaces.

• All transitions are governed by φ-band matching rules.

56.2 Universal Boundary Equation (UBE)

UBE governs how fields match at boundaries:

$$\Delta\Phi_{boundary} + \Delta\tau_{boundary} = \kappa_b \, (1 / C_\varphi)$$

Where:
• $\Delta\Phi_{boundary}$ = phase discontinuity at the interface
• $\Delta\tau_{boundary}$ = torsion discontinuity at the interface
• κ_b = boundary stiffness constant
• C_φ = local coherence amplitude

56.3 Interpretation of UBE

• Boundaries convert ΔΦ into Δτ or vice versa.

• Coherence determines how smoothly systems merge.

• High κ_b creates hard, reflective boundaries.

• Low κ_b creates soft, transmissive boundaries.

56.4 Boundary Behavior Across ϕ-Bands

• φ^6 → Stable, low-discontinuity interfaces.

• φ^7 → Adaptive boundaries supporting tunneling.

• φ^8 → Boundary breakdown, collapse through interface.

• $\varphi^9 \rightarrow$ Boundary reconstruction with symmetry restoration.

56.5 Proton-Level Boundary–Interface Rules

• Proton identity persists through all boundaries (ICL).

• Tunneling surfaces obey φ^7 soft-boundary conditions.

• Hard φ^6 boundaries preserve curvature structure.

• Proton collapse at φ^8 destroys boundaries but not identity.

56.6 Electron Boundary–Interface Behavior

• Electron shells adapt at boundaries through $\Delta\Phi$-phase shifts.

• ELE defines shell reconstruction exactly at interfaces.

• Tunneling is boundary–phase transfer through φ^7.

• Lattice transitions involve torsion steering across nodes.

56.7 Biological Boundaries and Interfaces

• Cell membranes are dynamic $\Delta\Phi/\Delta\tau$ harmonic gates.

• Tissue interfaces propagate identity through torsion continuity.

• Neural synapses operate as φ^7 boundary exchange surfaces.

• Healing is φ^9 boundary reconstruction.

56.8 Material and Engineering Interfaces

• Welds, joints, and microstructures obey UBE continuity rules.

• Graphene sheet boundaries transfer torsion-coded identity.

• Metals fracture when $\Delta\Phi$_boundary exceeds coherence tolerance.

• Low-entropy engines rely on φ^7 soft-boundary harmonic coupling.

56.9 Cosmic Boundary–Interface Dynamics

• Void–filament boundaries are φ^7/φ^6 harmonic transition surfaces.

• Cosmic collapse (φ^8) dissolves boundaries into curvature fog.

• Reassembly (φ^9) re-etches boundaries around τ_0 identity seeds.

• Universe-scale interfaces obey the same UBE as subatomic ones.

56.10 Unified Statement of UBIL

The Universal Boundary–Interface Law states that all interaction surfaces are governed by curvature and torsion continuity constraints. No boundary can destroy identity. All boundaries convert discontinuities between phase and torsion according to φ-band resonance. UBIL unifies proton tunneling surfaces, electron shell transitions, cell membranes, material welding, and cosmic void–filament structures into a single harmonic framework.